CSCI 201L Assignment #5 - Part 1

3.5% of course grade

Factory

Description

You will create a factory in which workers are assigned things to make. Workers will need to gather the materials in order to create their assigned item, and then build it. There will be a limited number of tools in the factory, so each worker must share the tools, so they can all work. The items workers must make are specified in a recipe folder. Each recipe is unique, and require different materials, tools, and work-areas.

Topics Covered

Multi-threaded Programming

Graphics

Requirements

You must have a folder somewhere in your project that contains 1 .factory file and a collection of .rcp files. You will be given a couple of starter .rcp files, but you are encouraged to make your own.

The .factory file specifies the number of workers and the number of each tool. This will be placed in the same folder as the .rcp files. You will be given a sample, however, it is encouraged you modify it to test a variable number of workers and tools.

You must have a task pane that holds all of the things to make. The number of various recipes can be large, so make sure to implement scrolling.

References:

Factory Materials: Wood, Metal, Plastic

Factory Tools: Hammers, Screwdrivers, Plyers, Scissors, Paintbrushes

Factory Work Areas: Anvils, Workbenches, Furnaces, Table saws, Painting stations, Press

Example .factory file:

```
[Workers:12]

[Hammers:3]
```

[Screwdrivers:8]

[Plyers:2]

[Scissors:1]

[Paintbrushes:5]

Example .rcp file:

[Widget] x5

[Wood:3]

[Metal:2]

[Use 1x Hammer at Anvil for 3s]

[Use 1x Hammer and 2x Screwdrivers at Workbench for 2s]

[Use Saw for 2s]

[Use Press for 2s]

[Use 1x Paintbrush at Painting Station for 10s]

Progression

Part 1 - Creating the window - [EASY]

Create a JFrame that is 800wx600h.

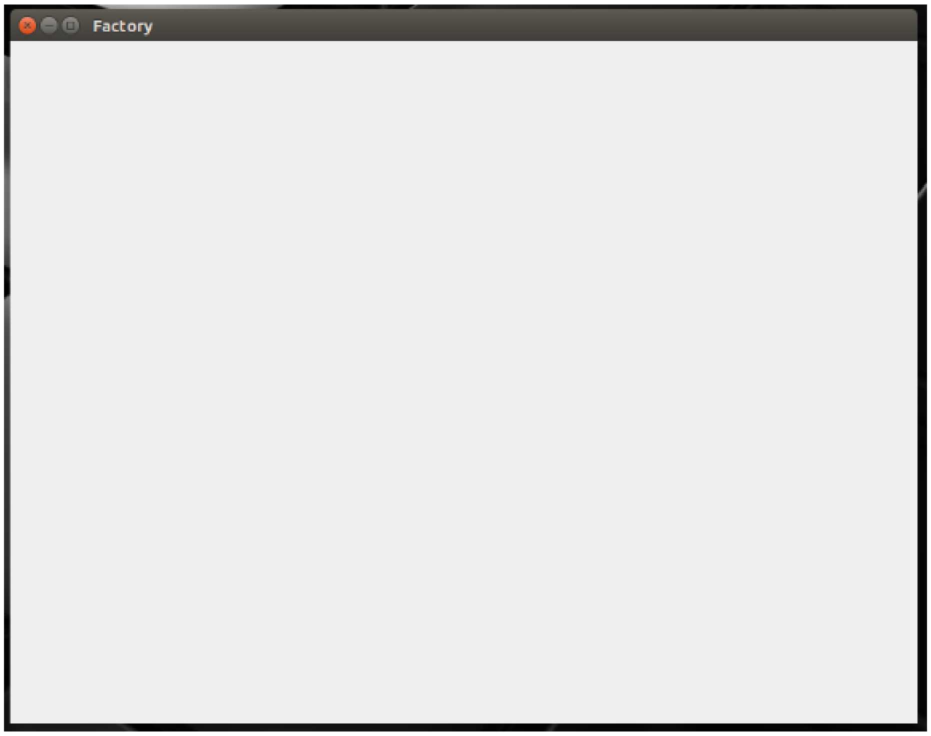
Name the window "Factory". If you think of something more creative, feel free to name it whatever you would like.

Make a Menu bar that has one item - "Open Folder..."

[Note]: This will work similar to how you selected an XML file, but in this case you are selecting a directory that contains the .factory file and .rcp files.

An example of what your program should look like at this point is shown below.

[Note]: I did not include the menu on the visuals, it will look like the one from Assignment 4.



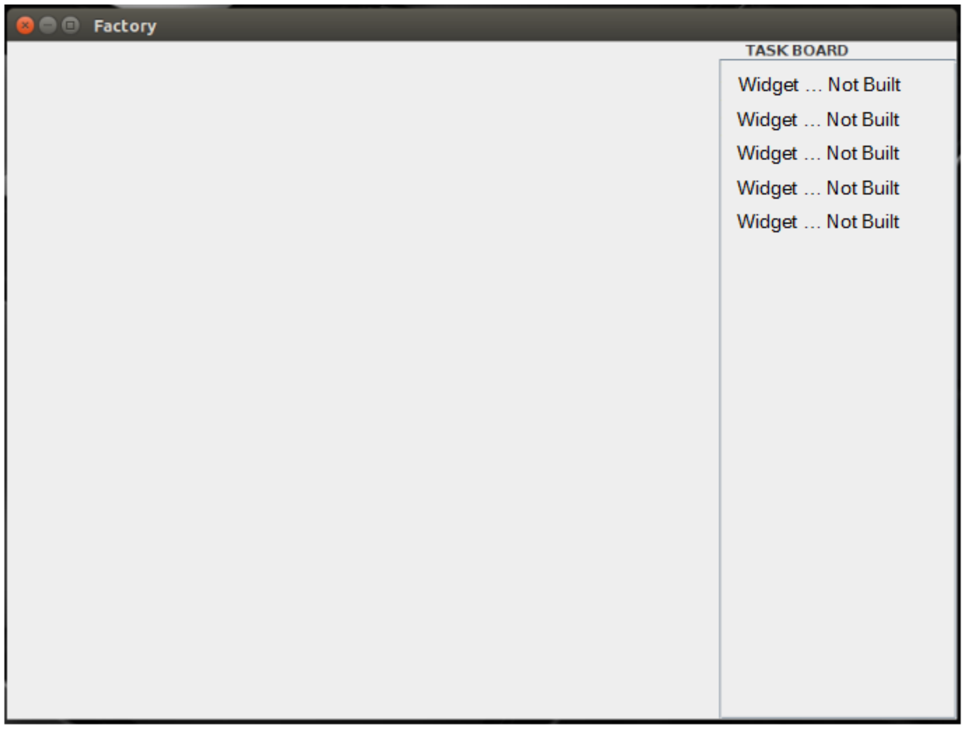
Part 2 - Creating the scrollable Task board - [MEDIUM]

Make sure you have a folder in your project that contains a .factory file and a couple of .rcp files. From inside here, read in all of the recipes. For now, you only need two bits of information from each .rcp file: The name and the number to make.

The first line of a .rcp file will contain the name in brackets followed by the number of them to make.

[EX]: [Widget] x5

If we only have one recipe file (.rcp file) for example, justWidget.rcp, the task board will look similar to like the one in the image below.



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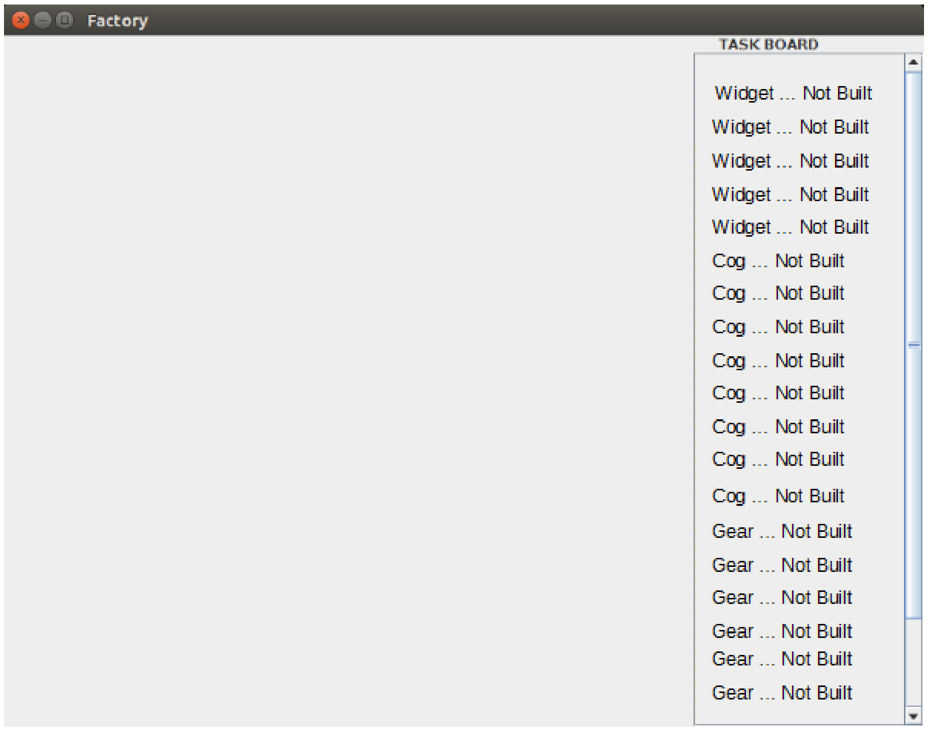
However, our factory will be able to create a large array of things. We need to make sure the Task board is scrollable. A filled up Task board is shown below that uses scrolling.



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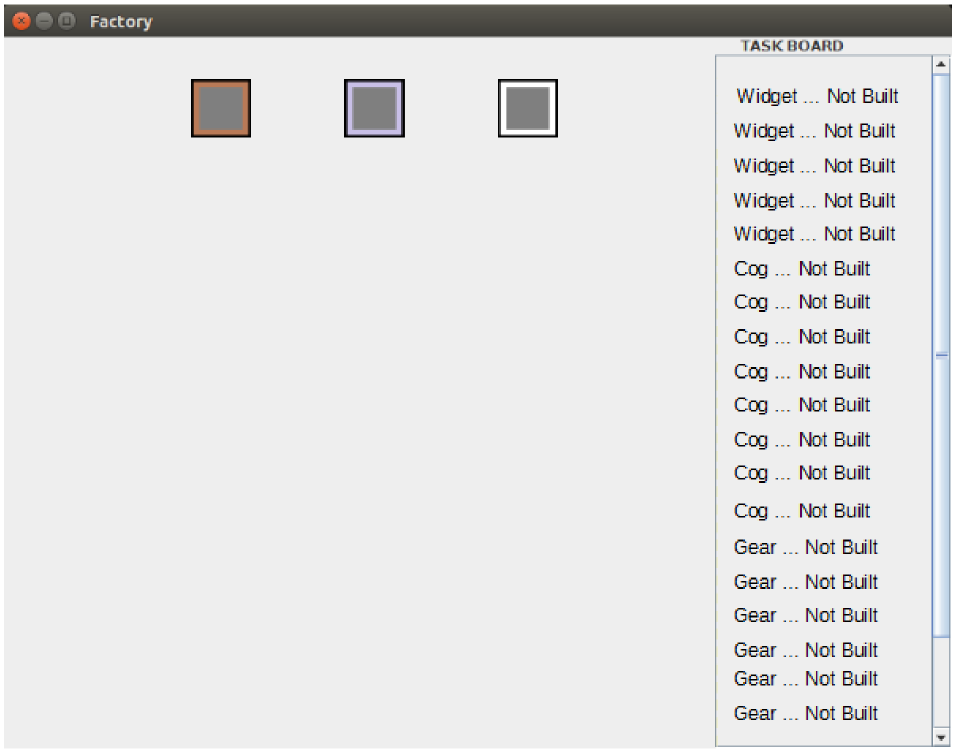
Part 3 - Creating the material containers - [EASY]

Without any materials, a factory would be useless. Set-up the containers for wood, metal, and plastic as shown below.



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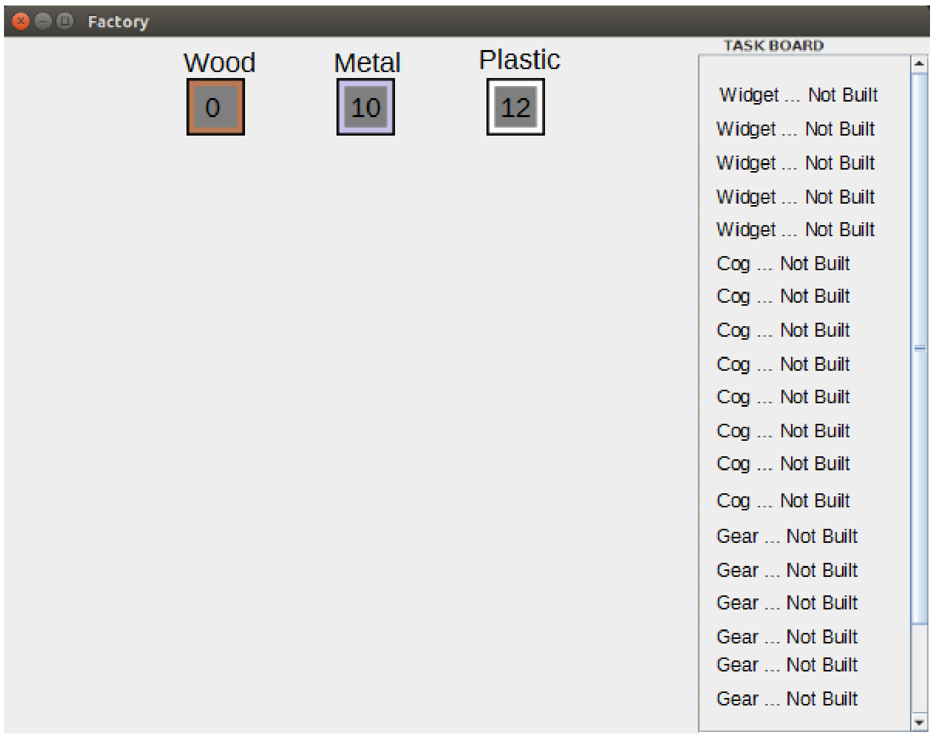
Now, add labels below and inside them. The label above is the material name. The label inside is the number of materials left in the container.

An example is shown below where there is 0 wood, 10 metal and 12 plastic.



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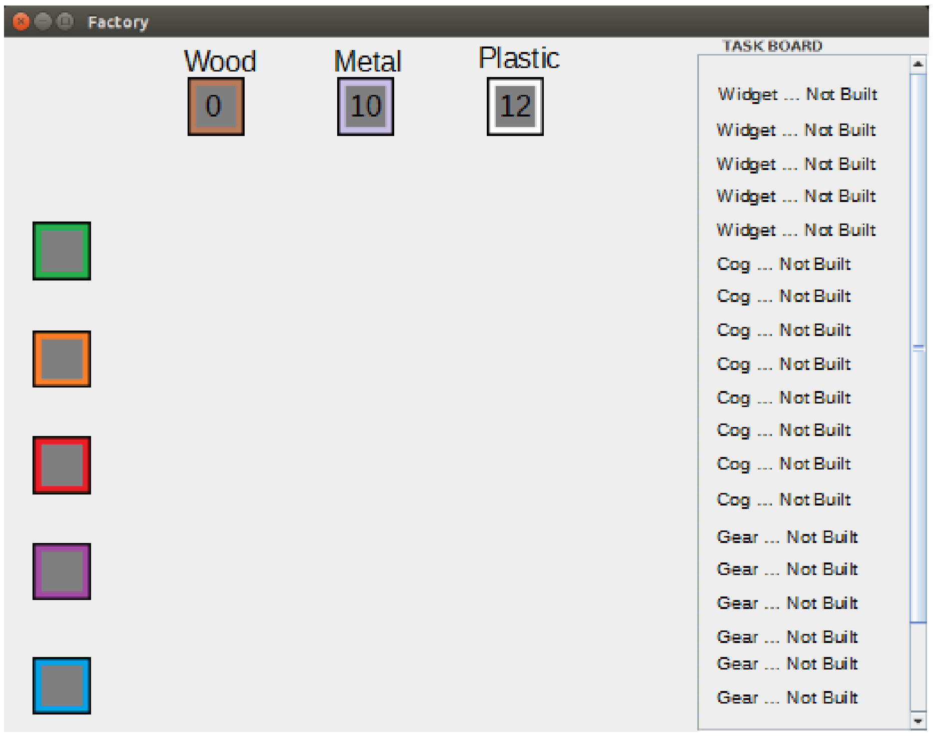
Part 4 - Creating the tool shed - [EASY]

It would be very hard to create anything without tools. Set-up the toolshed that contains hammers, screwdrivers, plyers, scissors, and paintbrushes as shown below.



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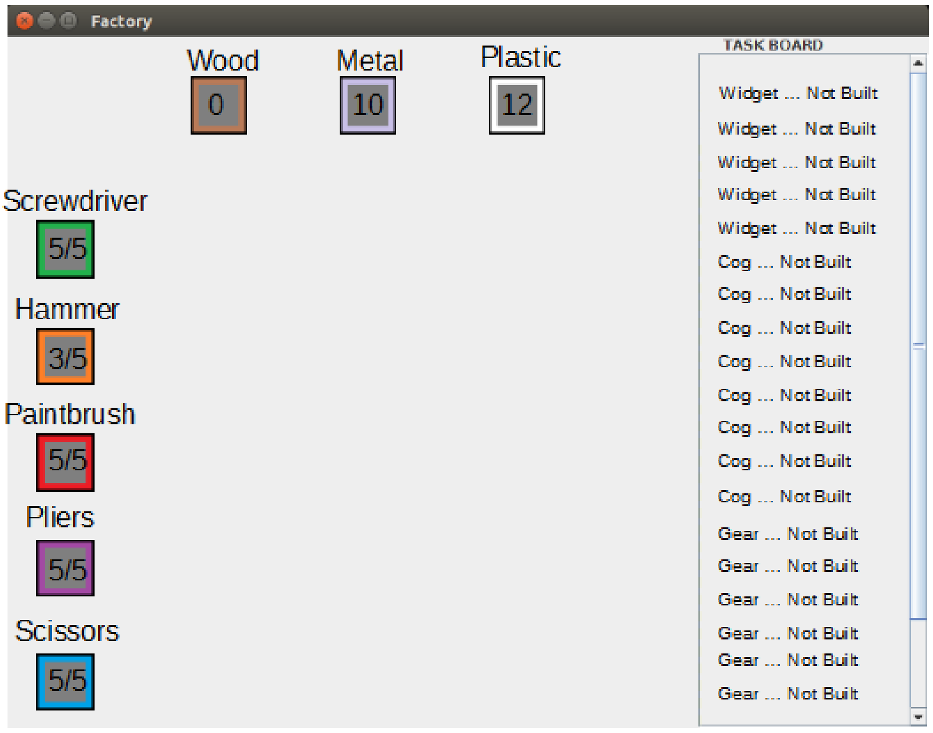
Now, add the labels. The top label is the name of the tool, and the center label is the number of remaining tools, a slash, and the total number of that tool.

An example is shown below where there are 5 of each tool, except 2 hammers are being used somewhere in the factory.



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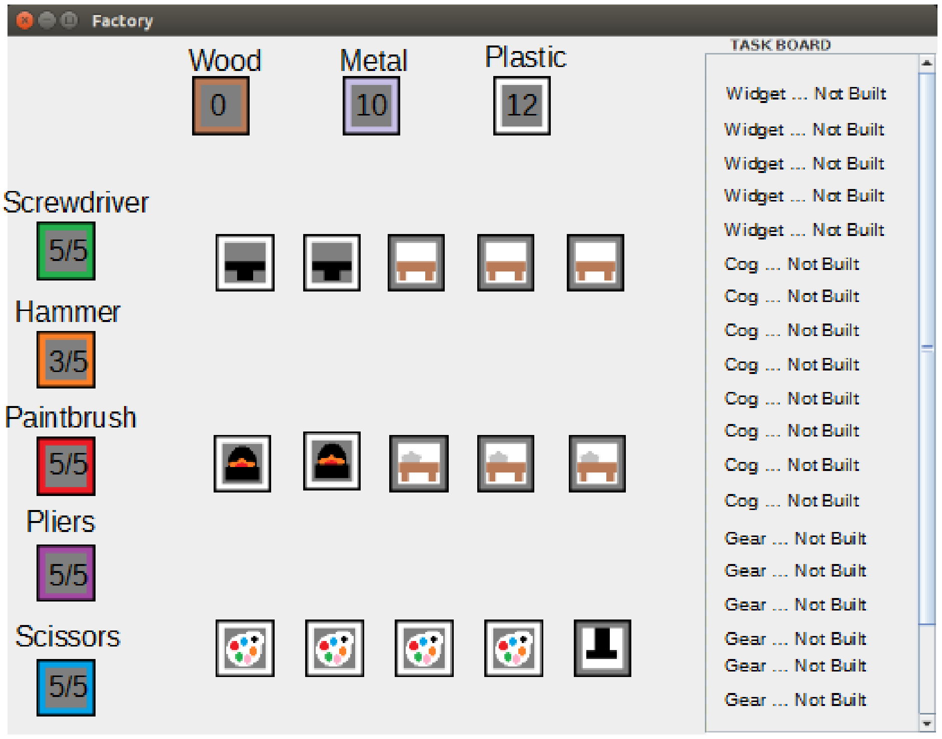
[Note]: All of the types of tools will have the full number at the start of the program.

[Note]: There will never be more than 9 of a given tool.

Part 5 - Creating the work areas - [EASY]

It would be impossible to build things without an area to work. Set up the anvils, workbenches, furnaces, table saws, painting stations, and press as shown below.



Wood 0
Metal 10
Plastic 12

Screwdriver 5/5
Hammer 3/5
Paintbrush 5/5
Pliers 5/5
Scissors 5/5

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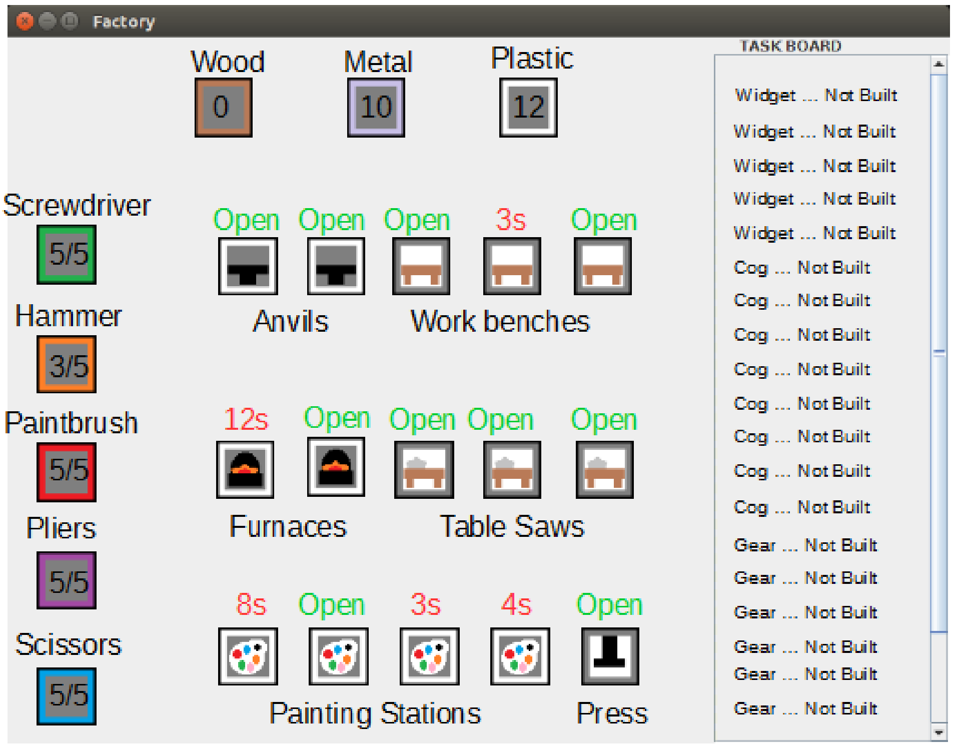
Now, add the labels. The bottom label is the name of the work area, and the top label is the amount of time left until something is built. If nothing is being built, it should read "Open" in green text. If something is being built, display the time in non-green text.

An example of some of the machines in use, and some machines available is shown below.



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Part 6 - Reading in recipes - [HARD]

.rcp files may look simple - but they can be a bit tricky. They aren't a normal file format. It is one that we have designed. So, we must create a parser designed just for it.

Notice that there are key words such as "Use", "and" "anvil", etc. that all give meaning.

1x Wood is pretty straight-forward. The recipe requires 1 wood.

[Use 1x Hammer and 1x Screwdrivers at Anvil for 4s] looks pretty complex.

However, we know:

"Use" indicates the tools.

"and" means there are more than just the first tool listed.

"at" gives us a location.

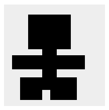
"for" gives us a duration of time.

Brainstorm a bit on how you will represent the recipes for the workers to be able to act upon.

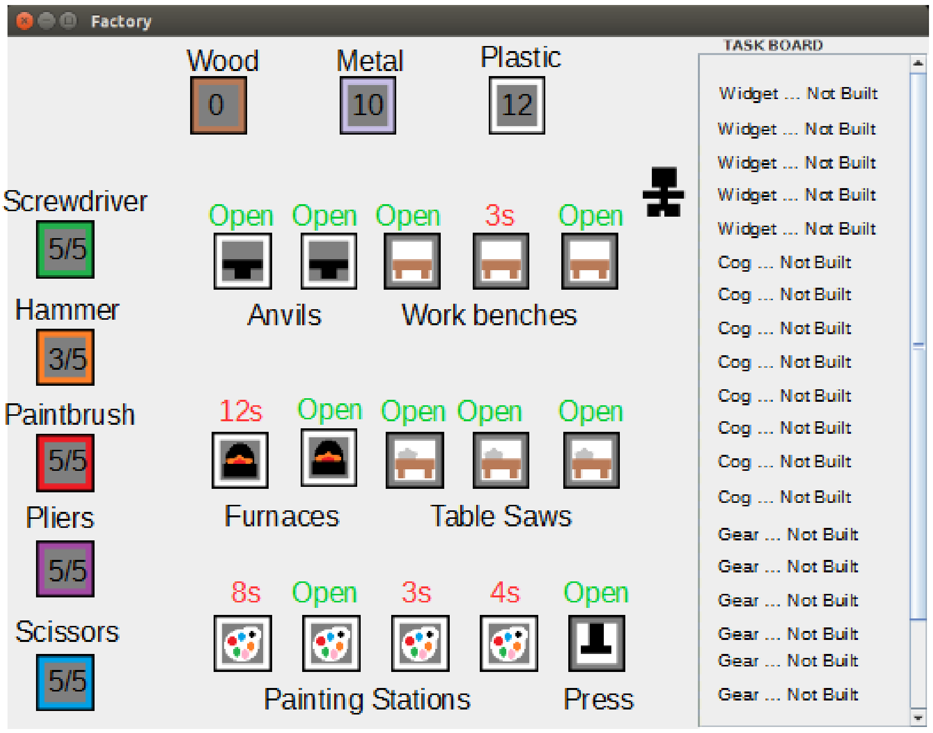
Part 7 - Implementing a worker Part A - [HARD]

Now that there are things to do, materials to craft with, tools to build, and appropriate work areas, it is time to actually make something. This first part will solely cover the movement of the worker, and how it interacts with the objects in the map. The examples in Part7-PartA do not represent a sample run.

Workers will be represented by little stick figures like one shown below.



Workers interact with the Task board by touching the edge of the factory.



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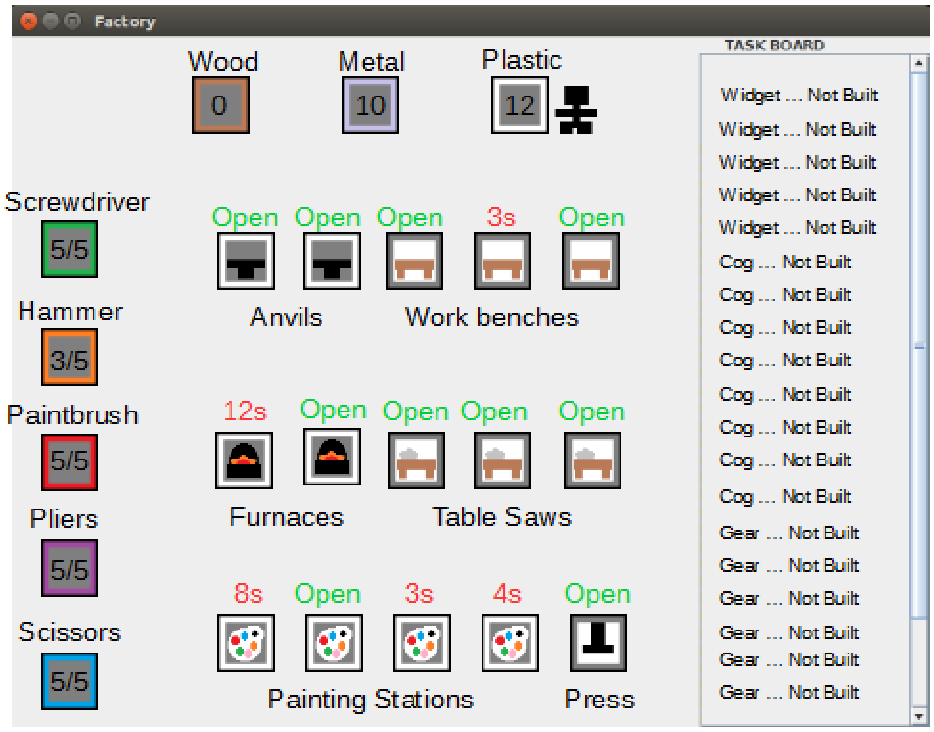
Workers interact with the material containers by walking up to them.



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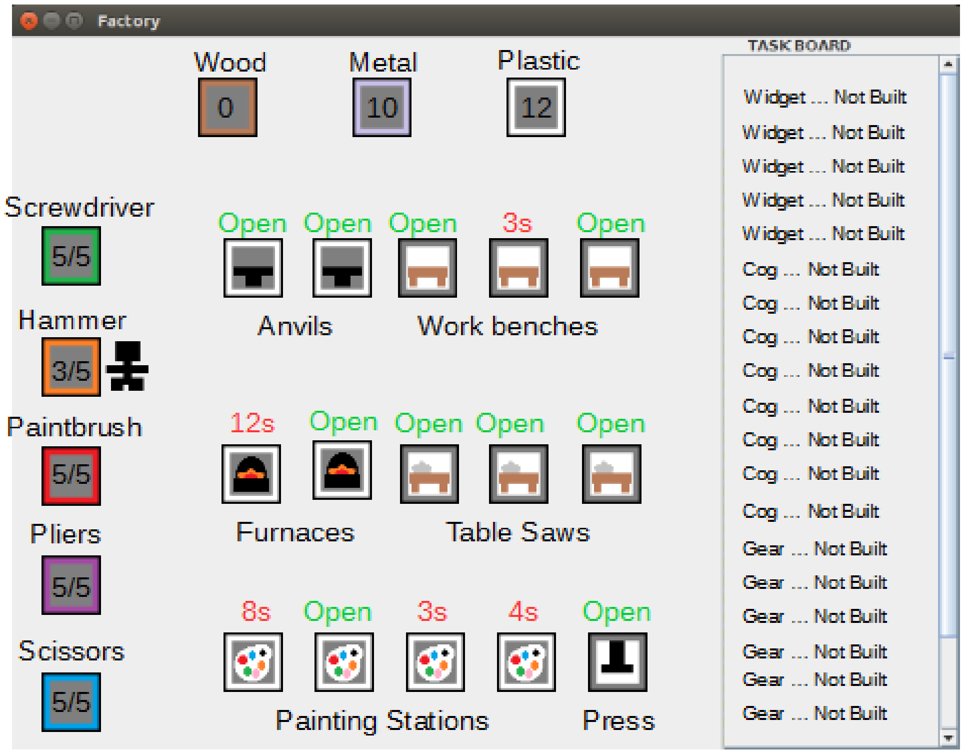
Workers interact with the tool shed by walking up to the tool they need.



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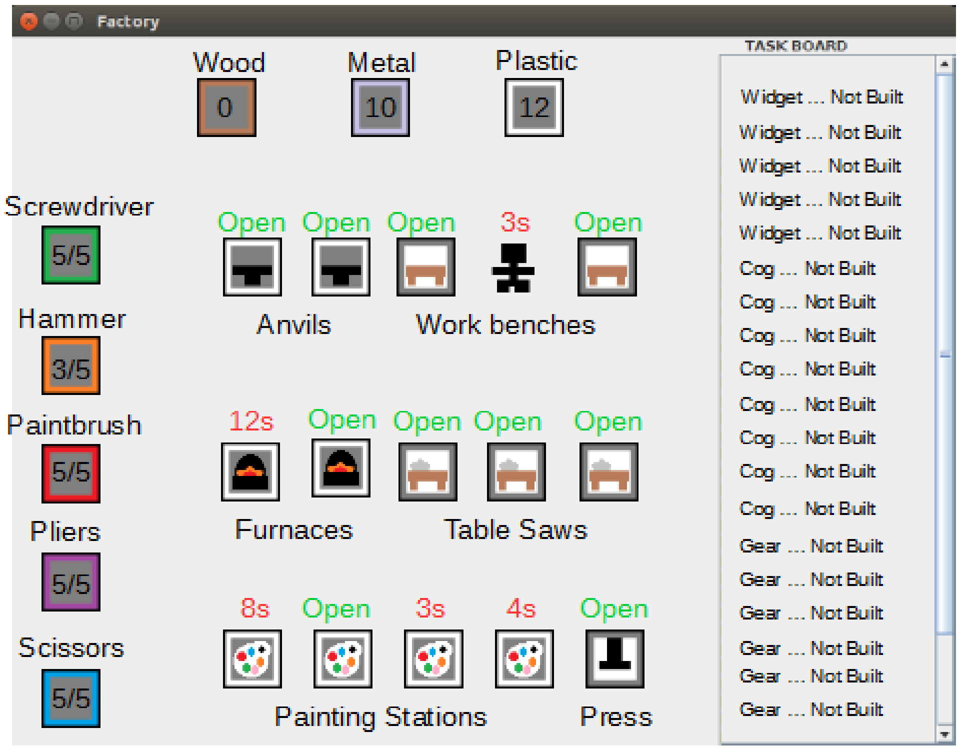
Workers interact with work areas by walking on-top of the icon of the work area. However, if the worker is not using the work area, it must navigate around it. It is recommended to create an underlying system that will help the workers move to specific points.



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Workers must not jump from one location to another. Their speed must be moderate, don't make it too fast or too slow.

Part 8 - Implementing a worker Part B - [HARD]

Now that it is understood how the worker moves, Part8 will go over a sample run. Suppose we have two workers, and two things to make - a widget and a cog.

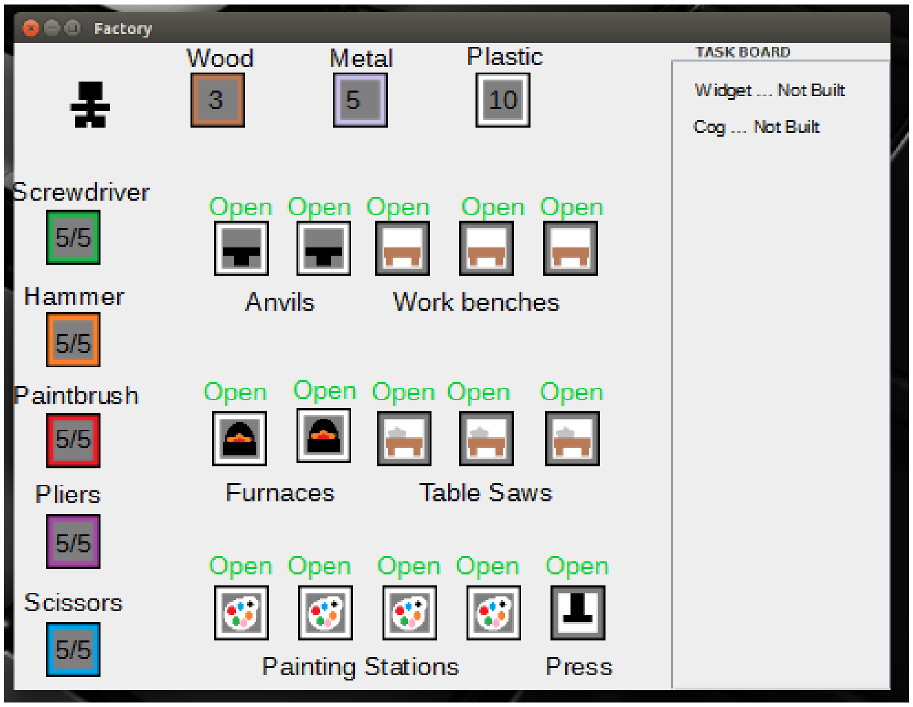
The Cog requires 2 metal and 1 plastic.

The cog must be made at the anvil for 3s with Hammer and pliers.

The Widget requires 1 plastic and 2 wood.

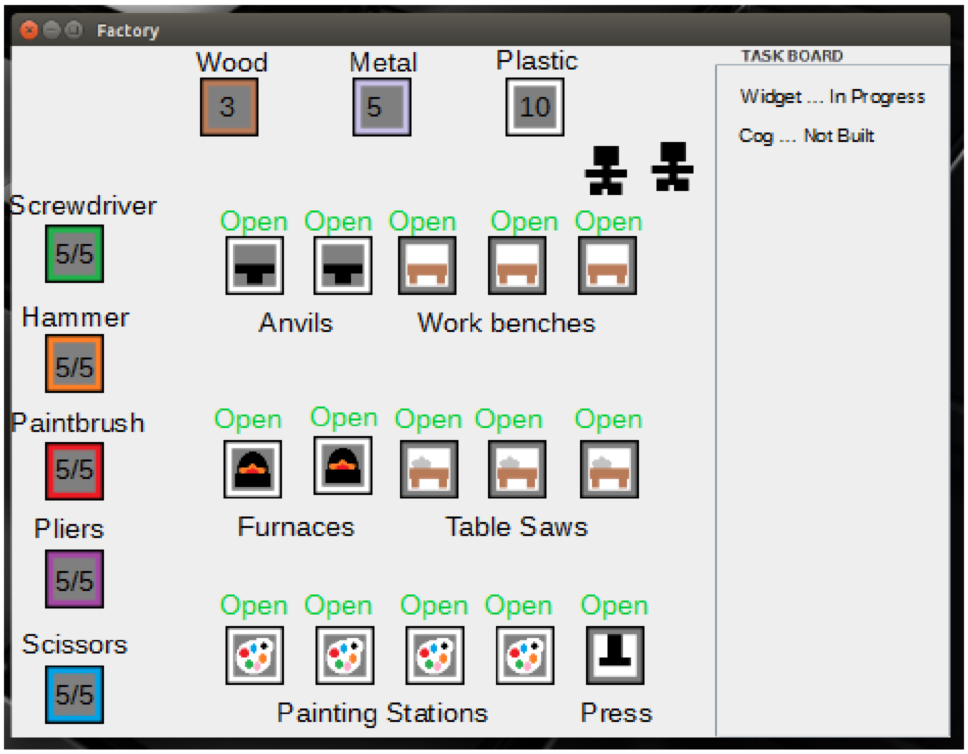
The Widget must be made at the table saw for 8s with Scissors and pliers.

The image below shows the start.

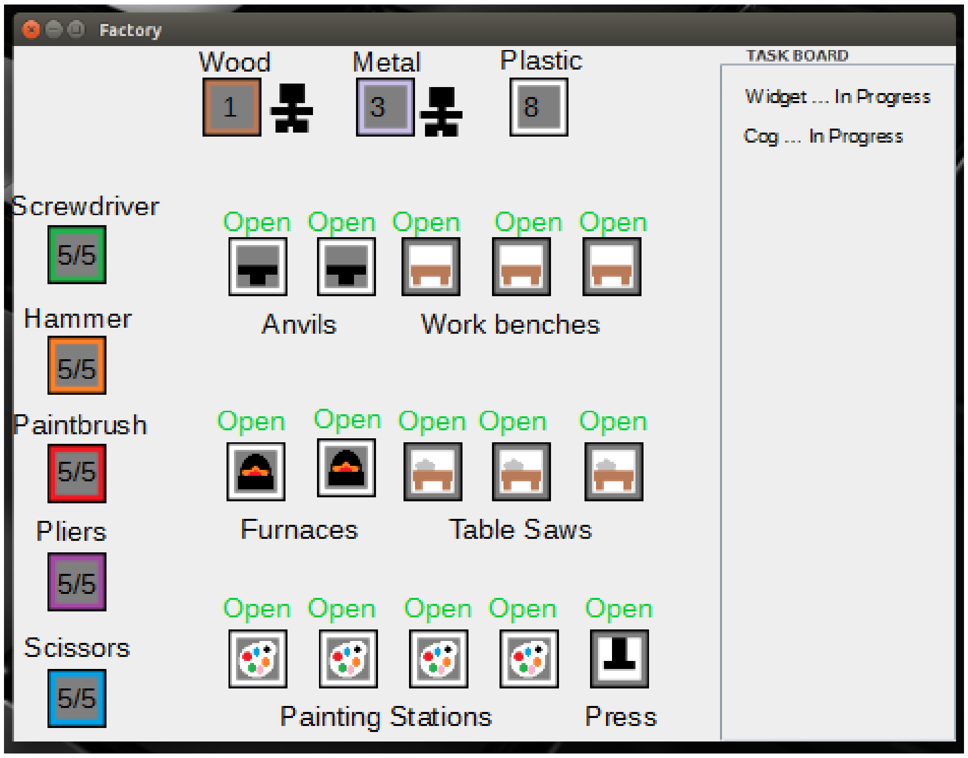


[Note]: Workers will spawn from the same place, and they can collide with one another. That is why the image shows only one worker.

Have the workers move to the task board, and grab a task, update the task to "In Progress".



Then have the workers go get the required materials.



Widget ... In Progress

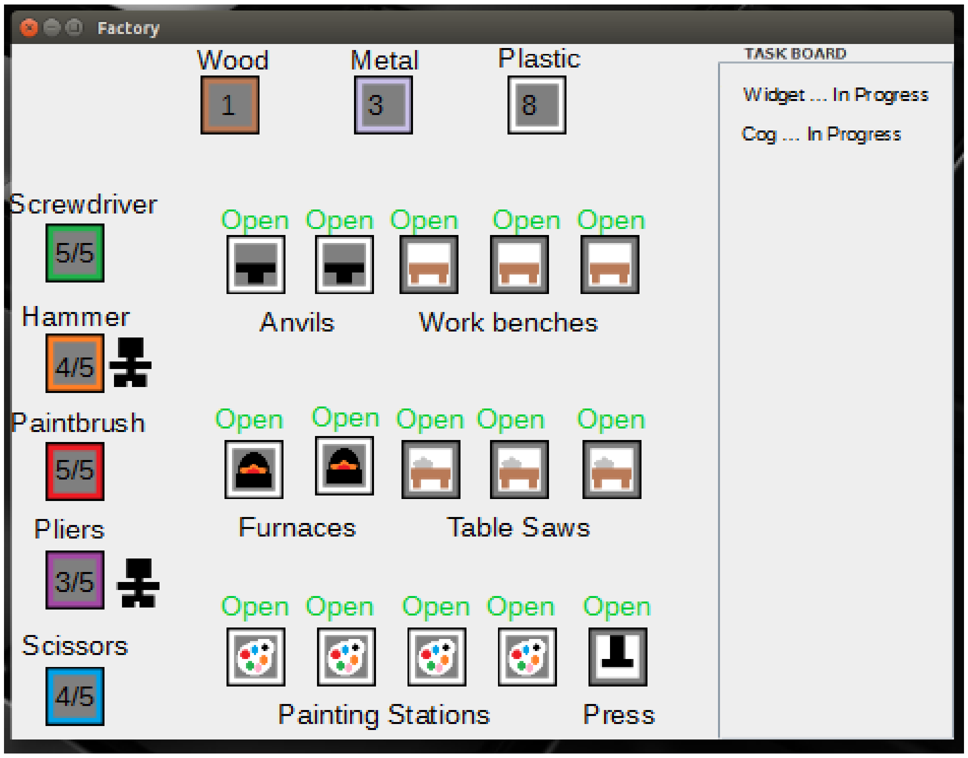
Cog ... In Progress

[Note]: The workers get all the materials they need for the entire build at once.

For each step of the recipe, get the required tools, move to the work area, wait for the worker to work, then return the tools.

The images below show this process.

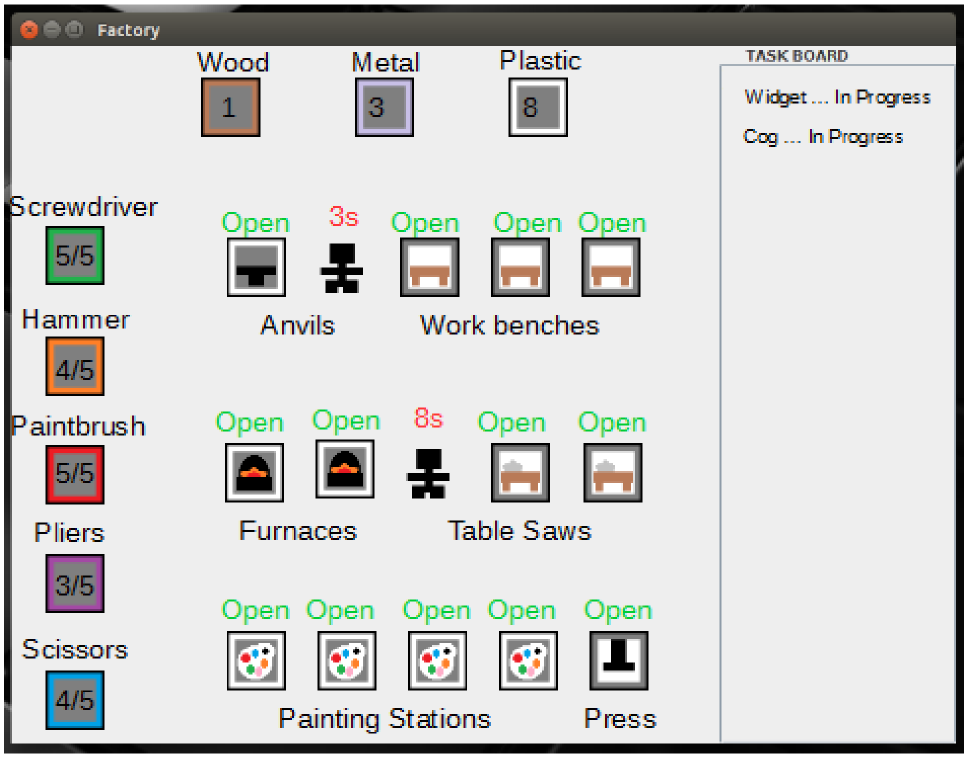
Here, each worker grabs the tools necessary for a step.



Widget ... In Progress

Cog ... In Progress

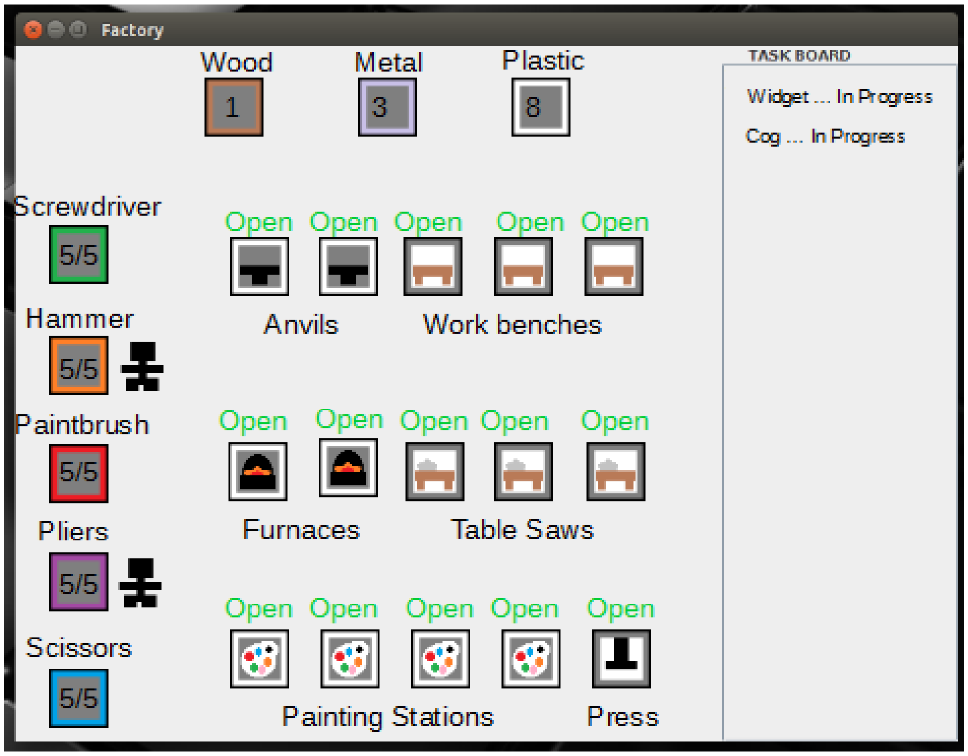
Once they have the tools, they go to the work area for the step and wait for the amount of time the recipe specifies.



Widget ... In Progress

Cog ... In Progress

The workers then return the tools so that others can use them.



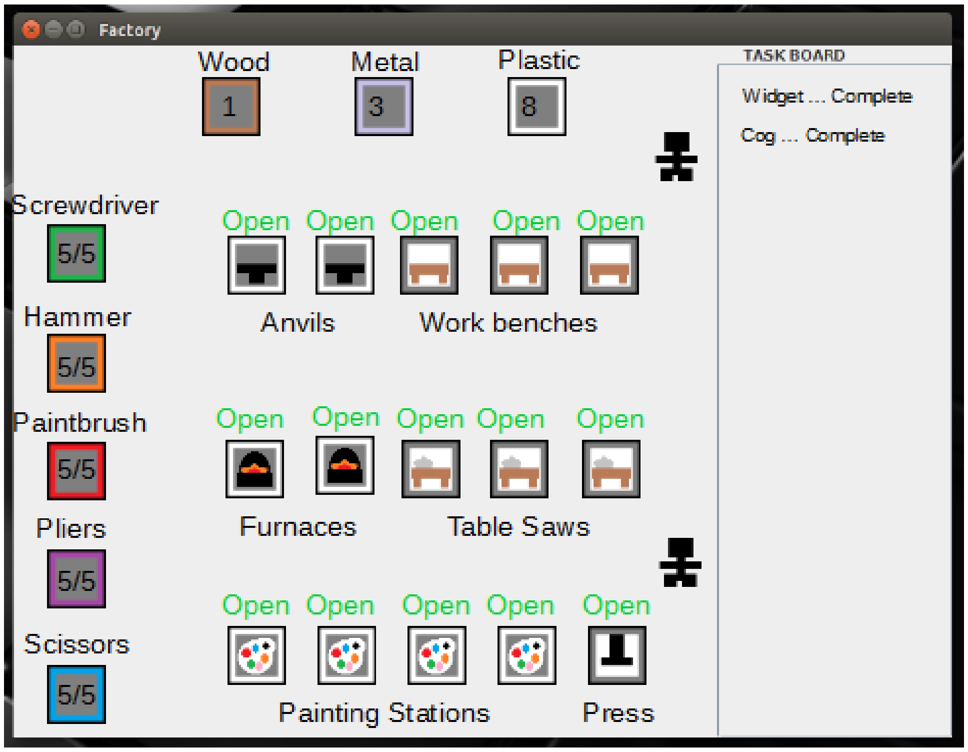
TASK BOARD

Widget ... In Progress

Cog ... In Progress

Part 9 - Completing a task - [MEDIUM]

Once a worker finishes making an item, have them walk back to the Task board. The worker will mark the task complete, and get a new task.



TASK BOARD

Widget ... Complete

Cog ... Complete

Once all recipes have been made, remove the workers from the map.

Create a pop-up that displays the time the simulation took, and prompt the user to choose a new directory, or exit the program.

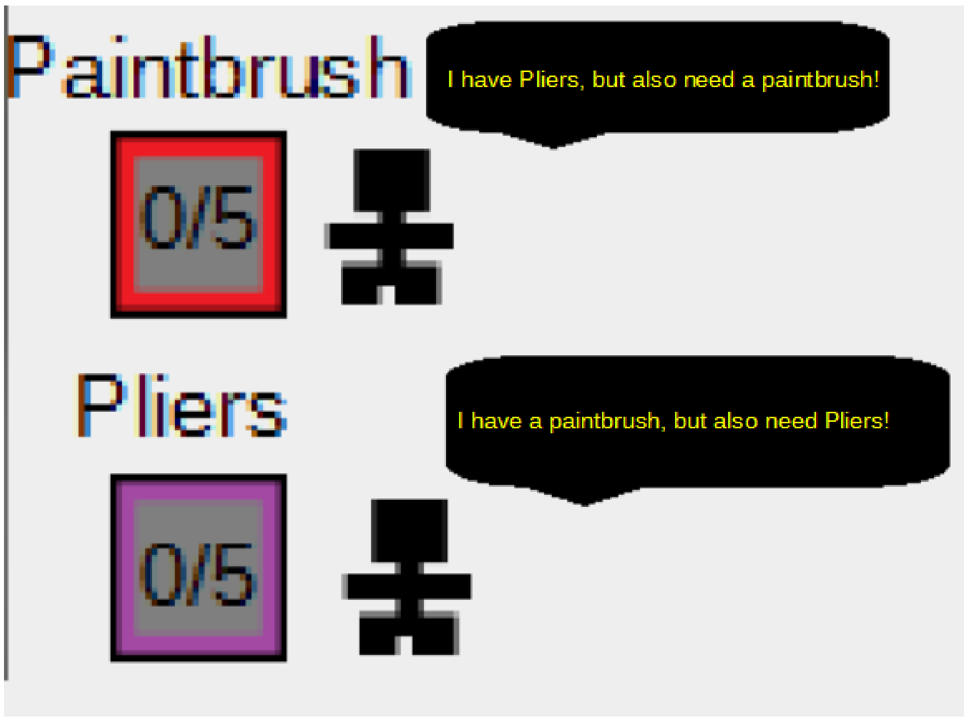
If they choose a new directory, the simulation will restart.

Otherwise, the program quits.

Part 10 - Adding more workers and recipes - [HARD]

Implementing one worker is simple, they could hog all of the tools, and it wouldn't matter.

There will be situations where the workers will grab the tool the other needs, and both will be stuck. Avoid this problem.


Paintbrush
I have Pliers, but also need a paintbrush!
0/5
Pliers
I have a paintbrush, but also need Pliers!
0/5

Grading Criteria

% Of Grade	Requirement
GUI - 0.5%	
0.25%	The map is laid out like as given in the examples.
0.25%	The task board is scrollable.
Task Board 0.5%	
0.25%	Workers can receive a task from the task board.
0.25%	Workers can check off tasks from the task board.
Materials 0.25%	Workers can gather materials.
Tool Shed 1.25%	
0.50%	Workers can grab tools.
0.50%	Workers can put away tools.
0.25%	Workers don't get stuck.
Crafting 0.25%	Workers craft materials for the required time.
Recipes 0.75%	The workers follow the recipes correctly.